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Conference Abstract

Virtual Systematics with Annotate: The Mexican archaeocyaths example

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Abstract

Digitization and online publishing of museum specimen data are happening worldwide. Studies based solely on online data become increasingly accessible. The current events, for example, reducing our transport-related carbon footprint or the COVID-19 pandemic, provide key opportunities to highlight the full value of digitized collections and their related tools, which allow us to continue our research from home or at least without travelling. Are existing data resources and tools adequate for engaging in a research project from beginning to end?

To address this issue, we propose to use the Mexican archaeocyaths digitized collection from the Museum National d'Histoire Naturelle, Paris, France (MNHN) and the freeware Annotate in order to describe and identify all the archaeocyaths from the Mexican Cambrian reef.

Archaeocyaths are aspiculate sponges that lived during the Cambrian Period. They were the first animals to build reefs. In the MNHN collection, they are found as thin-sections with several archaeocyaths per thin-section (Fig. 1). Multiple individuals are grouped under a single collection number and a single species name. The list of species in the thin-section is only captured on the paper label, and cannot currently be found online.

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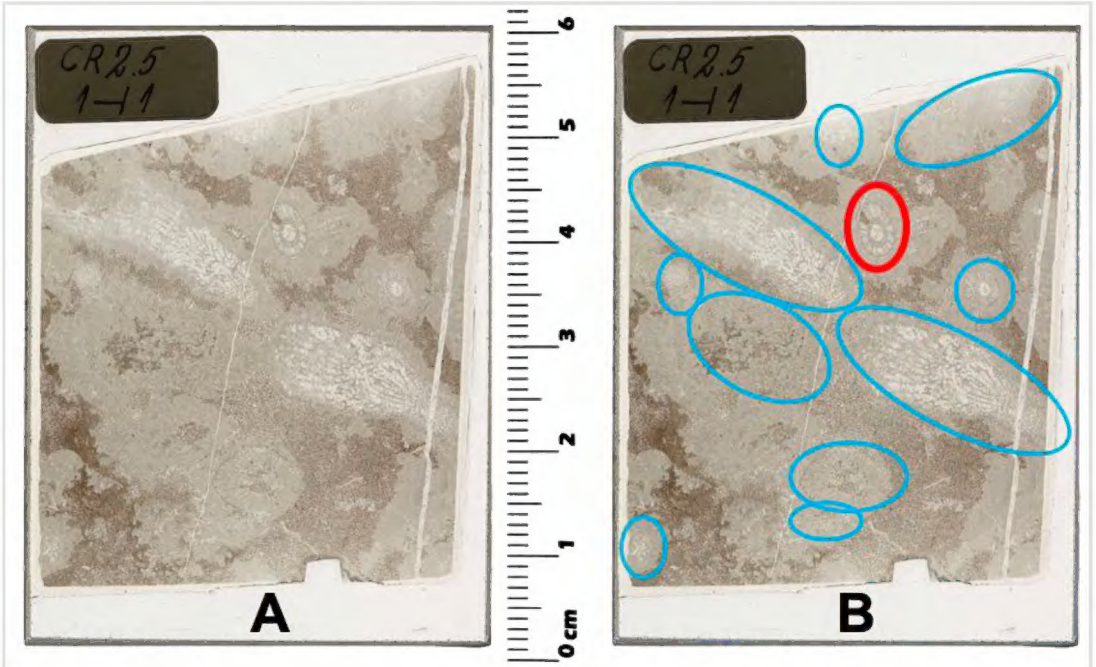

Figure 1.

Photo of the thin section MNHN.F.M83070. Identification of the specimen associated with the number in the collection:

Aulocricus arellani DEBRENNE, 1987. A. photo available online. B. in red *Aulocricus arellani*, in blue the other archaeocyaths. © RECOLNAT (ANR-11-INBS-0004) - Elise POREZ - 2017.

To study an archaeocyaths' reef, the archaeocyaths have to be described and identified one by one, and the location of each specimen has to be accuratly captured. Is it possible to do this with Annotate? Can a palaeontologist use only digitized specimens and Annotate to study a complete fauna of a given time and space?

Annotate is an image annotation tool for the natural sciences. It allows users to measure, count, and tag all the morphological structures of an organism. Photos may be imported from the Recolnat database or users may import their own photos. Users can measure lengths, surfaces, and angles, count occurrences and add points of interest. Users can also tag the different individuals to identify them.

Morphological terms may be imported as a standardized list from Xper2 or Xper3. Xper3 is a web platform that manages descriptive data and provides interactive identification keys. The results of the measurements and annotations can be exported into CSV format (comma-separated values) or into a structured descriptive data (SDD) format.

To identify an archaeocyath to genus level, we need to identify morphological structures and count the occurrence of some of them, and for an identification to the species level, we need to measure different additional parts. The standardized list of morphological terms has been imported from the archaeocyaths genera knowledge base and the list of measurements has been created directly in Annotate. Lengths (e.g., pore size, cup diameter), counts (e.g., number of septae, number of pores) and points of interest (e.g., tumuli, canals, septa) are easy to use.

What are the key lessons learnt to remember at the end of this study?

The digitized archaeocyaths from Mexico have been identified as easily with Annotate as if a microscope and thin sections were used. The CSV export provided quick access to statistics calculations.

- The main difference between a microscope and Annotate is the working time. Some functionalities of Annotate are not optimized, their uses are time consuming. For instance, the importation of photos is not really appropriate for archaeocyaths studies. Two sections (transversal and longitudinal) per specimen are necessary to see all the morphological structures. These two parts of the same rock are packed together with one collection number. While users can easily switch from one section to another with a microscope, they can not with Annotate. Annotate allows only one photo per collection number from Recolnat, but not images of the two sections and their metadata.

Although Annotate is not an intuitive tool to use it is still very powerful however, some training is required to fully take advantage of it, and there is no documentation available. This freeware has great potential as it can assist researchers in their work and proposes an alternative to the need to travel around the world to study a fossil.

Keywords

annotation, tag, measurement, identification, fossil, collection, Recolnat, Xper3, Archaeocyatha, palaeontology

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